Waitotaran Faunules of the Wanganui System:
and
Descriptions of New Species of Mollusca from the New Zealand Pliocene.

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The fifty miles of coastal cliffs which extend north-west from the mouth of the Wanganui River to beyond Hawera, provide a wonderful sequence of Pliocene strata, richly fossiliferous throughout.

For many years these deposits have been the subject of stratigraphical and palaeontological inquiry and research, but much remains to be accomplished before even the molluscan faunules of these beds are adequately known.

Interest in the Wanganui System has been revived during the past decade by the appearance of two outstanding papers by Marshall and Murdoch—"The Tertiary Rocks near Wanganui" (1920) and "Tertiary Rocks near Hawera" (1921). These papers gave the first comprehensive set of locality lists, together with a wealth of information relating to probable conditions of deposition, contemporary climate, and other inferences.

Apart from a review of the Waitotaran faunules at Hawera and Waipipi, the present paper includes descriptions of twenty-two new species of fossil mollusca from the Waitotaran and other stages in the North Island Pliocene, and also the description of a new Recent subspecies.

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The writer is indebted to Dr. J. Marwick for some opinions, the loan of types, and also for his generosity in permitting the description of a species which is based upon a specimen in the Geological Survey Collection. Also, thanks are due both to Mr. C. R. Laws for information relating to *Sinum* and *Heligmope*, and to Master C. A. Fleming, for his assistance in collecting during the field trip of January, 1931.

WAITOTARAN FAUNULES OF WAIHI, HAWERA AND WAIPIPI, NEAR WAVERLEY.

The cliffs at Waihi are moderately high, the lower fifty to sixty feet being composed of sandy blue-clay or papa. On top of this is a narrow shell-band, one to three feet in depth, which represents the raised Pleistocene Beach. Above this has accumulated over one hundred and fifty feet of Pleistocene to Recent (Notopleistocene of Thomson, 1917, p. 414.) stratified sands and gravels.

The soft nature of both the basal Waitotaran papa and the superimposed Pleistocene and Recent materials is the cause of frequent slips, it being a common occurrence for shells from the Pleistocene Beach to be found scattered among and even imbedded in the fallen masses of Waitotaran papa.

It seems evident that a few erroneous records, based upon shells from this uplifted Pleistocene Beach, have crept into Marshall and Murdoch's Hawera list and are one of the main causes of the relatively high Recent percentage given (indicated as 59 per cent.).

To cite examples, the writer has found that the following species of Marshall and Murdoch's list are common in the Pleistocene Beach deposit, but are absent from the Waitotaran papa, except as derived fossils:—*Ancilla depressa, Arca novaezelandiae, Calyptraea novaezelandiae inflata, Chione mesodesma, Thais* aff *lacunosa* and *Venericardia purpurata.*

An excellent account of this raised beach and its fauna has been published by Thomson—*"The Hawera Series, or So-called Drift Formation of Hawera"* (1917, p. 417). To this list, now must be added the following species:—*Emarginula striatula, Myadora striata, Dosinia maoriana, Dosinula zelandica, Paphirus largillierti, Austrofusus chathamensis, Gondwanula tumida, Baryspira depressa, Barnea similis* and *Lepsithais lacunosa.* Furthermore, Thomson's *Euthria linea* should be replaced by *Buccinulum caelatum* Powell 1929.

Thomson (l.c.) mentioned the occurrence in the Pleistocene beach deposit of a derived specimen of *Chlamys triphooki* and Dr. Marwick has informed the writer of a second derived Waitotaran form—*Glycymeris manaiaensis,* which he recently collected from the same bed.

A similar Pleistocene Beach deposit occurs above the papa at Waipipi. Here the fossiliferous band is very narrow, only about eight to ten inches in depth, and is composed of water-worn gravel, pebbles, and the following molluscan remains:—*Barbatia novaezelandiae, Dosinula zelandica, Tawera spissa, Modiolus areolatus, Chlamys zelandiae, Buccinulum caelatum, Sigapatella novaezelandiae, Emarginula striatula, Maoricolpus rosea, Baryspira mucronata, Herpetopoma larochei, Marginella* cf. *mustelina* (juvenile) and *Modelia* sp. (operculum).

Other supposed Recent species of Marshall and Murdoch's Hawera list have been described since or are herein described, as extinct forms ancestral to living species.

The field work at Hawera, amounting to about six whole days' collecting, was spread over a period of four years, so the list here published may be taken as fairly comprehensive, in spite of the relatively small number of species. This paucity in species is occasioned by the fact that only the larger forms are present in the beds. Even when the matrix is washed and sieved, the minute mollusca, foraminifera and bryozoa, so characteristic of the higher Wanganuian Beds are shown to be absent.

Only a short time was available for collecting at Waipipi, so this list cannot be considered representative. Marshall and

Murdoch enumerated seventy-two species for Waipipi, of which sixty-one per cent. were considered Recent. It seems evident that, as in the case of the Hawera Beds, the Recent percentage will be considerably reduced as the result of further investigation.

Revised Lists.			Corresponding Nomenclature of Marshall and Murdoch's lists (1920 and 1921).
PELECYPODA.	Waihi, Hawera	Waipipi	
Nuculana (Saccella) waihiana n. sp.	§	§	*Nuculana bellula* (A. Adams)
Neilo annectens n. sp.	§	§	
**Anomia undata* Hutton	§	—	*Anomia huttoni* Suter.
**Glycymeris (Grandaxinaea†) laticostata* (Q & G)	§	2	*Glycymeris laticostata* (Q. & G.)
Glycymeris (Veletuceta†) manaiaensis Marwick	§	—	*Glycymeris subglobosa* Suter
Glycymeris (Veletuceta†) waipipiensis Marwick	—	§	*Glycymeris subglobosa* Suter
**Mytilus canaliculus* Martyn	§	—	
Pedalion zealandicum (Suter)	§	§	*Melina zealandica* Suter
**Chlamys radiatus* (Hutton)	§	§	*Pecten zelandiae* Gray
Chlamys (Phialopecten) triphooki (Zittel)	§	§	*Pecten triphooki* Zittel
Sectipecten crawfordi (Hutton)	§	§	*Pecten semiplicatus* Hutton
Pallium (Mesopeplum) waikohuensis Marwick	§	—	
Lima waipipiensis Marsh. & Murd.	§	§	*Lima waipipiensis* M. & M.
Mantellum marwicki (Powell)	§	2	*Lima angulata* Sowerby.
Ostrea (Crassostrea) ingens Zittel	§	§	*Ostrea ingens* Zittel
**Ostrea charlottae* Finlay	§	§	*Ostrea angasi* Sowerby.
**Atrina zelandica* (Gray)	§	§	*Atrina zelandica* (Gray)
Eucrassatella marshalli n. sp.	—	§	*Crassatellites obesus* (A. Ad.)
**Divaricella cumingi* (Ad. & Ang.)	§	§	*Divaricella cumingi* (Ad. & Ang.)
Miltha (Milthoidea) neozelanica Marsh. & Murd.	2	§	*Miltha "zelandiae"* M. & M.
Pteromyrtea dispar (Hutton)	§	§	*Lucinida levifoliata* M. & M.
Zemysia ampla (Hutton)	—	§	*Diplodonta ampla* (Hutton)
**Tellinella ferrari* Marwick	§	—	
Tellinella cf. *eugonia* (Suter)	—	§	
Eurytellina solitaria n. sp.	§	—	
**Scalpomactra scalpellum* (Reeve)	§	§	*Mactra scalpellum* Reeve.
**Zenatia acinaces* (Q. & G.)	§	§	*Zenatia acinaces* (Q. & G.)
Lutraria solida (Hutton)	—	§	*Lutraria solida* (Hutton)
**Dosinia lambata* (Gould)	§	2	*Dosinia lambata* (Gould)
**Dosinia (Kercia) greyi* Zittel	§	§	
Dosinia (Raina) nukumaruensis Marwick	§	—	*Dosinia subrosea* (Gray)
Dosinia (Raina) waipipiensis Marwick	—	§	
Tawera errans Marwick	—	§	*Chione mesodesma* Q. & G.
**Dosinula zelandica* (Gray)	§	2	*Cytherea oblonga* (Hanley)
**Bassina yatei* (Gray)	2	§	*Chione yatei* (Gray)
**Paradione (Notocallista) multistriata* (Sowerby)	§	2	*Macrocallista multistriata* (Sowerby)
Marama murdochi Marwick	§	§	
Eumarcia plana Marwick	—	§	*Cytherea enysi* (Hutton)

Revised Lists.			Corresponding Nomenclature of Marshall and Murdoch's lists (1920 and 1921).
Eumarcia (Atamarcia) benhami Marwick	—	§	*Paphia curta* (Hutton)
Cardium spatiosum Hutton ..	§	§	*Cardium spatiosum* Hutton.
**Nemocardium (Pratulum) pulchellum* (Gray)	§	§	*Protocardia pulchella* (Gray)
**Gari lineolata* (Gray)	§	2	*Psammobia lineolata* Gray
**Notocorbula zelandica* (Q. & G.)	—	§	*Corbula macilenta* (Hutton)
**Panope zelandica* (Q. & G.) ..	§	§	*Panope zelandica* Q. & G.
**Offadesma angasi* (Crosse & Fischer)	§	—	———
Myadora waitotarana n. sp. ..	§	—	———
Pholadomya waitotarana n. sp.	—	§	———
GASTEROPODA.			
Emarginula haweraensis n. sp.	§	—	———
Maurea hawera (Oliver) ..	§	§	*Calliostoma selectum* (Chemn.)
Maurea (Mucrinops) granti n. sp.	§	—	*Calliostoma pellucidum* (Val.)
Maoricolpus cf. *rosea* (Q. & G.)	§	§	*Turritella rosea* Q. & G.
**Zeacolpus vittatus* (Hutton) ..	§	—	*Turritella carlottae* Watson
Zeacolpus (Stiracolpus) haweraensis n. sp.	§	2	*Turritella symmetrica* Hutton
Struthiolaria (Pelicaria) incrassata n. sp.	§	—	———
Struthiolaria (Pelicaria) zelandiae Marsh. & Murd. ..	§	§	*Struthiolaria zelandiae* M. & M.
**Struthiolaria papulosa* (Martyn)	§	—	*Struthiolaria papulosa* (Martyn)
Maoricrypta wilckensi (Finlay)	§	§	*Crepidula gregaria* Sowerby.
Zegalerus crater Finlay ..	—	§	*Calyptraea alta* (Hutton)
Polinices ovuloides (Marwick)	§	§	*Polinices ovata* (Hutton)
Polinices waipipiensis (Marwick)	§	§	*Polinices sagenus* Suter
Tanea haweraensis (Marwick)	1	1	*Natica zelandica* Q. & G.
Friginatica marshalli Marwick	§	1	———
Sinum cf. *marwicki* Laws ..	§	—	———
Globisinum flemingi n. sp. ..	—	§	———
Xenophalium fibratum Marsh. & Murd.	§	2	*Phalium fibratum* Marsh. & Murd.
**Cirsotrema zelebori* (Dunker)	§	—	———
Heligmope postulatus (Bartrum)	§	—	———
Austrofusus cf. *pagoda* Finlay..	§	§	*Verconella nodosa* (Hutton)
Zelandiella pliocenica n. sp. ..	—	§	*Siphonalia subnodosa* Hutton
Austrosipho (Verconella) haweraensis n. sp.	§	—	*Verconella mandarina* (Duclos)
Austrosipho (Verconella) aff. *dilatata* (Q. & G.) ..	§	§	*Verconella dilatata* (Q. & G.)
Coluzea spectabilis n. sp. ..	§	—	*Fusinus* aff. *spiralis* aff. *dentatus* (Hutton)
Zeatrophon bonneti (Cossmann)	§	—	———
**Poirieria zelandica* (Q. & G.)	§	—	———
Alcithoe gatesi Marwick ..	§	§	*Fulgoraria morgani* M. & M.
Alcithoe whakinoensis Marwick	§	§	*Cymbiola (Miomelon) corrugata* (Hutton)
Alcithoe haweraensis Marwick	§	§	———
**Alcithoe larochei* Marwick ..	§	—	———
Olivella (Lamprodomina) neozelanica (Hutton)	§	§	*Olivella neozelanica* (Hutton)

Revised Lists.			Corresponding Nomenclature of Marshall and Murdoch's lists (1920 and 1921).
**Baryspira mucronata* (Sowerby)	§	§	———
Marshallena austrotomoides n. sp.	§	—	———
Comitas declivis n. sp.	§	—	———
Phenatoma decessor Marwick..	§	—	———
Zeacuminia murdochi n. sp. ..	§	§	———
Perirhoe (Dimidacus) bicorona (Hutton)	§	—	———
SCAPHOPODA.			
Dentalium solidum Hutton ..	§	§	*Dentalium solidum* Hutton
Dentalium (Laevidentalium) pareorense Pilsbry & Sharpe	§	§	*Dentalium pareoraensis* Pilsbry & Sharpe

†Iredale 1931. Rec. Aust. Mus. vol. 18, pp. 202-203.

*Species still living.

1. From Marwick's published papers (1923-1931, Trans. N.Z. Inst., vols. 54, 55, 56 and 57, and N.Z. Geol. Surv. Pal. Bull. No. 13).
2. From Marshall and Murdoch's lists (1920 and 1921, Trans. N.Z. Inst., vols. 52 and 53).

The suggested synonymy in the above list cannot be considered absolutely authoritative, as the writer has not seen the actual material upon which Marshall and Murdoch based their records.

SUMMARY.

Total of species from Waihi, Hawera	73
Number of extinct species	47
Percentage of Recent species	35.62
Total of species from Waipipi (not a representative collection) ..	61
Number of extinct species	43

Further collecting is necessary at this locality before a reasonably accurate Recent percentage can be given.

ANALYSIS OF THE FAUNULES.

A noteworthy feature of both the Waihi and the Waipipi faunules is the persistence of a number of long-range stragglers from Miocene times—*Zeacuminia, Marshallena, Comitas, Sinum, Eucrassatella, Pholadomya, Dentalium solidum, D. (Laevidentalium) pareorense, Cardium spatiosum, Pallium waikohuensis, Miltha, Zelandiella* and the large *Polinices*. The first six of the above mentioned genera make new records for our Pliocene, for it was formerly assumed that these genera became extinct in New Zealand with the close of Miocene times.

This does not imply that the Hawera beds are older than formerly supposed, for the genera cited above are represented by only odd occurrences, none characteristic of the beds and evidently all failed to survive the Waitotaran.

Probably their extinction, along with other warm-water types, was caused by a gradual change to a colder climate at about this time. This question of Wanganuian climate has been dealt with at some length by Marshall and Murdoch in their valuable paper on "Tertiary Rocks near Hawera."

Six genera represented in the Waitotaran Fauna and which are now confined to waters warmer than New Zealand Recent seas are *Pedalion, Miltha, Pholadomya, Olivella, Perirhoe* and *Sinum*.

The dominant shellfish at Waihi, arranged in their order of relative abundance, are: *Polinices waipipiensis, Ostrea* cf. *charlottae, Chlamys triphooki, Sectipecten crawfordi, Divaricella cumingi, Pteromyrtea dispar* and *Maoricrypta wilckensi*. Of these *Polinices* was a vigorous carnivore, as evidenced by the number of valves of *Pteromyrtea* and *Divaricella*, which exhibit naticoid radulæ borings. (Naticoid borings, particularly those produced by *Polinices*, are characterized by a large, smooth, circular depression, which, with the aid of an acid secretion, is formed by the under-side of the proboscis, the actual perforation, only, being the work of the radula.)

At Waipipi, the dominant species are *Cardium spatiosum, Eucrassatella marshalli, Baryspira mucronata, Glycymeris waipipiensis, Eumarca plana* and *Polinices waipipiensis*. This faunule showed a marked scarcity of *Polinices* and a preponderance of heavily-built pelecypods, suggesting shallower-water deposition than in the case of the Hawera faunule.

The genera *Sinum* and *Olivella* and the species *Struthiolaria papulosa* are typical of shallow-water sandy flats in clean-water locations, but, on the other hand, these are not present in quantity, and furthermore, *Chlamys radiatus, Poirieria zelandica, Scalpomactra scalpellum, Alcithoe larochei* and the analogous living species to *Coluzea spectabilis, Eucrassatella marshalli, Lima waipipiensis* and *Neilo annectens* are always associated with moderately deep water.

Moreover, the absence of shallow-water herbivorous gasteropods also indicates that these beds were laid down at a distance from littoral communities. All things considered, the Hawera faunule suggests depths between twenty-five and thirty fathoms, and probably slightly shallower in the case of the Waipipi beds.

Still another occurrence of more than ordinary interest is *"Turbo" postulatus* Bartrum, a recognisable fragment of which was found by Mr. C. R. Laws, imbedded in the matrix of a large *Chlamys triphooki* from Hawera.

Recently Finlay (1931, pp. 1-6) has demonstrated the importance of this type of shell in the correlation of widely separated faunules, pointing out that it belongs to a short-lived genus *Heligmope,* a probable member of the pelagic *Ianthinidae.*

The Kaawa fauna, which has been assigned to the Waitotaran by Marwick (1927, p. 576), is decidedly shallow-water in character, and there *Heligmope* occurred in abundance, but at Hawera it was absent except for the fragment referred to above. However, Dr. Marwick states that he has six specimens of this shell from near the mouth of the Waingongora, an adjacent locality, where the faunule and lithology are much the same as at Hawera beach.

The scarcity of *Heligmope* in the Waitotaran of South Taranaki may be attributed to the obviously deeper-water conditions of deposition than in the case of the Kaawa beds, for although Recent *Ianthina* is cast ashore in great abundance at certain seasons on most Australasian oceanic beaches, these shells are very light and buoyant, and on this account are seldom encountered in our offshore dredgings. Taking this into consideration, the scarcity of *Heligmope* in the Waitotaran of Hawera and Waipipi is not surprising.

DESCRIPTION OF SPECIES.

Nuculanidae.

Genus Nuculana Link 1807.

Type (monotypy): *Arca rostrata* Linn.

Subgenus Saccella Woodring 1925.

Type (original designation): *Leda commutata* Philippi.

Nuculana (Saccella) waihiana n. sp. Fig. 15.

Shell somewhat similar in shape to the Lower Pliocene *N. tenellula* Bartrum and Powell from Kaawa Creek, but differing in the ribbing, which is a trifle coarser and of a distinctly flexuous pattern, and in the shape of the rostrum, which is not strongly uptilted. The usual concentric ridges, which are about three or four per millimetre at the middle of the shell, become suddenly decurrent towards the sides and then abruptly upcurved to the dorsal margin, almost at right angles. The posterior line of deflection occurs at a short distance below the strong ridge which runs from the umbo to the rostrum. On the anterior end, the line of deflection occurs at about a corresponding position. Posterior area broad, concave, free from sculpture, and bounded below by the strong ridge already referred to.

Height (estimated), 4.0 mm.; length, 7.5 mm.; thickness (1 valve), 2.0 mm. (holotype).

Height (estimated), 5.0 mm.; length, 10.0 mm.; thickness (1 valve), 2.0 mm. (paratype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Localities. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran) (Type); Waipipi, on coast near Waverley (Waitotaran).

The sole specimen from Waipipi, which locality has been considered to be four hundred feet higher in the series than Waihi, Hawera, has the posterior deflection of the sculpture less pronounced. It is typical in shape, however, the rostrum being neither strongly uptilted as in *tenellula*, nor sharply pointed as in the Recent *bellula*. The only fossil specimens of *bellula* the writer has so far examined are from the basal papa at Castlecliff.

MALLETIIDAE.

Genus NEILO Adams 1854.

Type (monotypy): *N. cumingii* Adams = (*Nucula australis* Q. & G.).

Neilo annectens n. sp. Fig. 25.

Shell of moderate size, apparently intermediate between the Miocene (Taranakian) *sublaevis* and the Recent *australis*. The sculpture consists of closely packed, weak, concentric growth folds, about five per millimetre. *Australis* has distant sharp, thread-like ridges, about one and a-half per millimetre, and *sublaevis* has the sculpture obsolete over the greater part of its surface, the little that is apparent (mostly on the anterior end) being similar in character to that of *annectens*. The Hawera species may be distinguished from *sublaevis* by the much shallower posterior concavity and the sculpture, which is evenly distributed, showing no tendency towards obsolescence. Hinge normal, imperfectly shown (paratype), but apparently similar to that of *australis* in the number and development of the teeth. The posterior end is truncated and almost vertical, with a slight sinus in the middle, but without a projecting upper rostrum, as in *australis*.

Length, 24.0 mm.; height, 13.0 mm.; thickness (1 valve), 4.5 mm. (holotype).

Length, 23.0 mm.; height, 13.0 mm.; thickness (1 valve), 4.5 mm. (paratype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Localities. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran); Waipipi, on coast near Waverley, ¾ mile west of the mouth of Wairoa Stream (Waitotaran). (A.W.B.P. Jan., 1931.)

PECTINIDAE.

Genus PALLIUM Schumacher 1817.

Type: *Pecten plica* Linn.

Subgenus MESOPEPLUM Iredale 1929.

Type (original designation): *Mesopeplum caroli* Iredale.

Pallium (Mesopeplum) waikohuensis Marwick 1931. Fig. 18.

N.Z. Geol. Surv. Pal. Bull. No. 13, p. 63. Type. Ormond Series; block II., Waikohu S.D. Upper Miocene (Taranakian).

A large specimen from Waihi, Hawera (Fig. 18) seems to be the adult of Marwick's species, for it has identical details of sculpture and the same curious apical-step development. In the holotype the large size of this step portion, relative to the later shell-growth, suggests that it is a juvenile. Dr. Marwick has seen a photograph of the Hawera shell and agrees that it is inseparable from his Ormond species.

Height, 15.0 mm.; length, 14.5 mm. (holotype).
Height, 52.0 mm.; length, 58.0 mm. (Hawera specimen).

CRASSATELLITIDAE.

Genus EUCRASSATELLA Iredale 1924.

Type (original designation): *Crassatella kingicola* Lamk.

Eucrassatella marshalli n. sp. Figs. 21 and 22.

Shell moderately large, solid, elongated, and subtruncated posteriorly. Anterior end short, rapidly descending, convex, imperceptably merged into broadly convex ventral margin. Posterior end more gradually descending, almost straight. Truncation moderately wide, slightly oblique and subangled above and below. There is a very slight external fold running from the umbo to the lower angle of the truncation. Initial sculpture of coarse sulcations about one per millimetre and extending not more than eight millimetres down from the umbo, after which the shell is smooth except for faint lines of growth.

Hinge identical with that of the genotype, even to the characteristic downward bulge in the middle of the plate and the massive anterior cardinal of the left valve. Left valve with two cardinals, the massive anterior and a thin posterior bordering the chondrophore. Right valve with three cardinals, a narrow anterior and a massive median with an inconspicuous lamellate posterior diverging from its side. There is an anterior and a posterior lateral in each valve. Adductor muscle scars of identical shape to those of the genotype.

Height, 49.5 mm.; length, 65.5 mm.; thickness (1 valve), 13.5 mm. (holotype).

Height, 49.0 mm.; length, 68.5 mm.; thickness (1 valve), 14.0 mm. (paratype).

Height, 47.0 mm.; length, 64.0 mm.; thickness (1 valve), 12.5 (paratype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. Waipipi, coast near Waverley, at about ¾ mile west of the mouth of Wairoa Stream (shell-band in papa), Lower Pliocene (Waitotaran).

Although this species fades into insignificance when compared with the ponderous Oligocene and Miocene *ampla* and *attenuata,* it more nearly approaches the size of the Recent Australian genotype.

The extinction of this type of shell in the Lower Pliocene of New Zealand, along with a number of other species of warm-water facies, points to a definite climatic change at about this time, an observation which has been recorded by Marshall and Murdoch (1920, p. 125).

The above described species was recorded in Marshall and Murdoch's list (l.c.p. 124) as *Crassatellites obesus* A. Adams, but doubts have been expressed concerning the locality originally given for *obesus,* which was described as a Recent shell from New Zealand.

Adams' figure shows a shell with strong sulcations persistent over most of the shell, quite unlike any New Zealand *Eucrassatella* or *Spissatella.*

Iredale has suggested that this shell may not be Neozelanic at all, but a juvenile Australian *Eucrassatella* (Finlay, 1926, p. 257.) Dredging operations up to the present have failed in locating anything approaching *obesus* in New Zealand waters.

TELLINIDAE.

Genus TELLINELLA Morch 1853.

Type: *Tellina virgata* Linn.

Tellinella ferrari Marwick 1931.

N.Z. Geol. Surv. Pal. Bull. No. 13, p. 75.

Type. 1161, Pakaurangi Point, Kaipara. Upper Oligocene (Hutchinsonian).

Although the type is an early Tertiary shell and there is a closely related series, *eugonia,* from the Upper Pliocene, the Recent shells so far examined all conform to *ferrari.*

The writer has examined fossils referable to *eugonia,* from Castlecliff (type locality), Kai Iwi and Waipipi. These shells are characterised by fine, crowded, flattened ridges, with linear interspaces, whereas the sculpture in *ferrari* consists of sharp, concentric ridges with moderately wide interspaces. In addition to the Upper Oligocene type, and Recent specimens, the writer has examined three typical *ferrari* from Waihi, Hawera and another from Castlecliff.

Apparently the two species lived side by side throughout the Pliocene, but *eugonia* has not survived to Recent times.

Genus Eurytellina Fischer 1887.

Type (Monotypy): *Tellina punicea* Born.

Eurytellina solitaria n. sp. Fig. 40.

Although the hinge is badly damaged, the obsolete flexure, feeble concentric sculpture, presence of lateral teeth and elongate-oval outline, present a combination of characters suggestive of relationship with *punicea* Born, the Recent genotype, which is from the Pacific coast of Northern South America. This species is admirably figured by Chenu in his Manuel Conchyliologie. (1862, vol. 2, p. 67, figs. 278 and 279.)

Shell of moderate size, compressed and elongate-oval in outline. Umbones at the posterior three-eighths. Rostrum rounded, situated at about half the height; with obsolete flexure, but having a narrow flattened area defined by a slight ridge, which runs from the umbo to the base of the rostrum. Sculpture of fine raised concentric threads, three to five per millimetre. Hinge badly damaged, but showing definite traces of a posterior lateral.

Height, 15.0 mm.; length, 26.5 mm.; thickness (one valve), 3.0 mm.

Holotype (one right valve) in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

Myochamidae.

Genus Myadora Gray. 1840.

Type (subsequent designation, Gray, 1847): *Pandora brevis* Sowerby.

Myadora waitotarana n. sp. Figs. 26 and 27.

This species is ancestral to the Recent *antipodum*, which it closely resembles in every particular except size. The Waitotaran fossil attains a length of more than twice that of the largest recorded Recent specimen. Also the Lower Pliocene shells from Kaawa Creek, recorded as *antipodum* by Bartrum and Powell (1928, p. 160) appear to be immature examples of this new species. Young specimens of the fossil species compared with typical *antipodum* of corresponding size, show that the former lack the strong convexity of the Recent shells.

Length, 28.00 mm.; height, 20.00 mm.; thickness, 6.00 mm. (holotype).

Length, 13.33 mm.; height, 9.00 mm.; thickness, 2.00 mm. (holotype of *antipodum*).

Length, 8.50 mm.; height, 5.75 mm.; thickness, 2.00 mm. (Average from series of *antipodum* from 30 fath. off Hen and Chickens.)

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

PHOLADOMYACIDAE.

Genus PHOLADOMYA Sowerby 1823.

Type: *Pholadomya candida* Sowerby.

Pholadomya waitotarana n. sp. Fig. 16.

Shell elongate-oval, cuneate, moderately inequilateral. Umbones situated at a little in front of the middle. Anterior end short and flattened, with a slight ridge running from the base of the flattened area to the umbonal region. Posterior end produced and attenuated. Shell substance typical; thin and nacreous. Sculpture consisting of simple, distant, slender, radiate ribs, which are confined to the median portion of the valves. The ribs are twelve in number, the first, which is the strongest, being situated at a little behind the anterior fold, after which the ribs diminish in strength. The whole shell is crossed by irregularly developed concentric growth folds. The only specimen is badly crushed and in consequence the right valve appears to overlap the left, but normally the valves would be equal and the umbones level. However, the left valve has escaped distortion and presents the normal outline.

Height, 29 mm.; length, 53 mm.; thickness (left valve), 11.5 mm. (holotype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. Waipipi, on the coast near Waverley, near mouth of Wairoa Stream.

Lower Pliocene (Waitotaran).

Pholadomya is a very conservative genus of great geological antiquity, being known from as early as the Lower Lias. It reached its greatest development in the Mesozoic, declined during the Tertiary, and is to-day represented by but one solitary species, which lives in deep water in the West Indies.

New Zealand has Lower Tertiary members of this genus in *P. neozelanica* Hutton, which was described from an unknown horizon in the Oamaruian, and in a related new species from the Lower Miocene (Awamoan) of Awakino Valley.

The above described Pliocene species, however, is not closely related to either of these, being more ovate-oblong and less inequilateral; nearer in shape to *P australica* Tate (1894, p. 187), which was described from the Australian Upper Tertiary.

FISSURELLIDAE.

Genus EMARGINULA Lamarck 1801.

Type: *Patella fissura* Linn.

Emarginula haweraensis n. sp. Fig. 17.

Shell very large, broadly ovate and spreading. Elevation moderate; apex recurved and situated at the posterior three-eighths. Sculpture consisting of moderately strong radials crossed by fine concentric cords. The radials are approximately equal in number to those of *striatula,* but differ in their development. Both primary and secondary radials are more nearly equal

in size and have a tendency to become broader and flatter towards the margin, resulting in only linear interspaces. For this reason it is a difficult matter to sort out primary cords in the adult shell, but a half-grown paratype shows about 44. Furthermore, owing to these linear interspaces the concentric cords merely delicately imbricate the radials; definite reticulation being apparent only in the vicinity of the apex. In the holotype there are about 118 definite radials at the margin (including both primaries and secondaries), of which 86 extend to the apical area.

Length, 42.00 mm.; breadth, 33.75 mm.; height, 17.00 mm. (holotype).

Length, 17.00 mm.; breadth, 12.25 mm.; height, 8.00 mm. (Average dimensions of Recent *E. striatula.)*

Length, 26.00 mm.; breadth, 20.75 mm.; height, 11.00 mm. (Extra large specimen of Recent *E. striatula valentior* Finlay.)

Holotype. In writer's collection. (Collected Jan., 1927.) Two paratypes, one damaged and the other half grown, in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

This is the largest species of the genus so far recorded for New Zealand.

CALLIOSTOMATIDAE.

Genus MAUREA Oliver 1926.

Type (original designation): *Trochus tigris* Martyn.

Subgenus MUCRINOPS Finlay 1926.

Type (original designation): *Zizyphinus spectabilis* A. Ad.

Maurea (Mucrinops) granti n. sp. Figs. 34 and 35.

Shell acutely conical, moderately solid, inperforate and subangled at the periphery. Spire one and one-half times height of aperture. Outlines straight. Whorls $10\frac{1}{2}$, including typical protoconch. Sculpture fine, consisting of numerous closely spaced beaded spiral cords and interstitial threads, crossed by dense microscopic axial growth striae. Early post-nuclear whorls with three beaded cords, later whorls with six, each interspace having a fine spiral thread, which becomes beaded towards the close of the penultimate whorl. Base with twelve beaded cords, four closely spaced at periphery, the remainder more distant; each with a plain interstitial thread. Periphery angled, but not acutely. Columella oblique, arcuate, rather massive.

Height, 34.25 mm.; diameter, 28.5 mm.; angle of spire, 62 degrees.

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

This shell is ancestral to the living *osbornei* (Powell, 1926, p. 591), from 27 fathoms off Cape Barrier, Great Barrier Island.

However, *osborni* differs in having a more acute spire and coarser sculpture, with obsolescent interstitial threads.

The species is named after Mr. James Grant, of Wanganui.

NATICIDAE.

Genus SINUM Roeding 1798.

Type : *Helix haliotoidea* Linn.

Sinum cf. **marwicki** Laws, 1930. Fig. 36.

Trans. N.Z. Inst., vol. 61, p. 551. Type. White Rock River. Lower Miocene (Awamoan).

A shell from Waihi, Hawera (Fig. 36) is referable to this species, the only difference being a slight variation in the sculpture, which may or may not be constant. Compared with *marwicki,* the Hawera shell has the ridges more closely spaced and the width of the interspaces a little less than that of the ridges. However, in size, shape, basal characters and dimensions the Hawera specimen is so close to the White Rock River species that separation is not justifiable upon the basis of the available material.

Mr. Laws kindly supplied information concerning his *S. marwicki* and Marwick's *S. infirmum,* both of which, he states, have the interspaces wider than the ridges.

Height, 5 mm.; minimum diameter, 11.5 mm.; maximum diameter, 15 mm. (Hawera specimen.)

Height, 5 mm.; minimum diameter, 11.0 mm.; maximum diameter, 14 mm. (Holotype).

Genus GLOBISINUM Marwick, 1924.

Type (original designation) : *Sigaretus drewi* Murdoch.

Globisinum flemingi n. sp. Figs. 10A and 10B.

In possessing a narrow umbilical chink, the Waipipi shell more closely resembles the Awamoan *miocaenicum* and *crassiliratum* than the Upper Pliocene *drewi* and *wollastoni.*

It is difficult to gauge the original strength of the sculpture, as the surface is worn, but it was certainly stronger than that of the two Upper Pliocene species, but probably not quite so pronounced as in *miocaenicum.*

Unfortunately the solitary specimen has been slightly distorted by pressure; originally the sides were probably not so flattened.

However, the most distinctive character of the Waipipi shell is the umbilical chink. This is narrower than in either of the two Awamoan species and is situated lower down, almost at half the height of the aperture.

It is interesting to note that the position and development of the umbilical chink in the Waipipi shell indicates an intermediate position between the Awamoan and the Castlecliff species.

Height, 21.5 mm.; diameter, 19.0 mm.

Holotype. Presented to the Auckland Museum by Master C. A. Fleming.

Locality. Waipipi, coast near Waverley, near mouth of Wairoa Stream. Lower Pliocene (Waitotaran).

The writer is indebted to Master C. A. Fleming for this species, which was discovered in the matrix of a large *Cardium spatiosum*.

TURRITELLIDAE.

Genus MAORICOLPUS Finlay 1926.

Type (original designation): *Turritella rosea* (Q. & G.).

Maoricolpus cf. **rosea** (Q. & G.).

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

These shells are almost identical with Recent specimens, differing only in having a slightly smaller spire angle and a comparatively straight outline, which is the result of more or less equal development of the biangulate cords. The sculpture, however, is extremely variable, making it a difficult matter to cite any true differentiating characters. Moreover, typical *rosea* certainly lived in Waitotaran times, for the writer collected a specimen at Waipipi, which locality has been estimated by Marshall and Murdoch (1921) to be 400 feet higher in the series than Waihi, Hawera.

From there it continued to Recent times with little variation in either spire angle or sculpture, always characterized by a greater prominence of the lower biangulate cord, which imparts a slightly gradate outline to the spire.

There is a second Recent form which seems to have diverged from the lower Waitotaran type of shell by becoming considerably narrower, whereas *rosea* has developed a wider spire-angle and a greater prominence of the lower cord of the biangulation.

The only relatively constant character in the *rosea* series is the spire angle. In typical *rosea*, taking series ranging from Waipipi to Recent times, this angle is 19.5 to 21 degrees, whereas in the second Recent form its maximum variation is between 14 and 16 degrees. However, in the Hawera fossils the spire angle is intermediate, having a range between 17 and 18 degrees, so it is not considered advisable to separate these shells from *rosea*, particularly as the sculpture is variable.

On the other hand, the narrow Recent form is well worthy of separation, as it seems to represent the culmination of a divergence foreshadowed in the Lower Pliocene.

Maoricolpus rosea manukauensis n. subsp. Figs. 9 and 10.

The distinguishing characters of this shell are shown in the following table by comparison with a series of specimens of *rosea* from Recent and fossil localities.

rosea manukauensis.

Height.	Diameter.	Spire angle.
59.00 mm.	13.00 mm.	14 degrees (holotype)
56.00 mm.	13.50 mm.	16 ,,
55.00 mm.	12.50 mm.	15.5 ,,

rosea (Recent).

Tasman Bay, Nelson.

70.00 mm.	21.50 mm.	22 degrees
53.00 mm.	19.00 mm.	22 ,,
57.50 mm.	19.50 mm.	22 ,,

Picton.

62.00 mm.	18.25 mm.	21 degrees
56.00 mm.	18.25 mm.	22 ,,
43.00 mm.	13.75 mm.	21 ,,

Stewart Island.

40.00 mm.	13.50 mm.	21 degrees
38.00 mm.	13.00 mm.	22 ,,

Tauranga.

59.00 mm.	20.00 mm.	22 degrees
56.00 mm.	18.00 mm.	21.5 ,,

Auckland Harbour, 6 fathoms.

47.00 mm.	14.50 mm.	19.5 degrees
41.00 mm.	12.75 mm.	19.5 ,,

Parua Bay, Whangarei.

74.00 mm.	22.50 mm.	21 degrees
45.50 mm.	14.00 mm.	21 ,,

Kawhia Harbour.

48.00 mm.	15.00 mm.	21 degrees
42.00 mm.	14.00 mm.	22 ,,

rosea (fossil).

Castlecliff (Castlecliffian).

86.50 mm.	25.50 mm.	21 degrees
69.00 mm.	22.00 mm.	22 ,,

Maraekakaho, H.B. (Nukumaruan).

66.00 mm.	17.00 mm.	22 degrees
30.00 mm.	10.50 mm.	22 ,,

Waipipi (Waitotaran).

65.00 mm.	19.50 mm.	19.5 degrees

Waihi Beach, Hawera (Waitotaran).

80.00 mm.	19.50 mm.	17.75 deg.
68.00 mm.	17.00 mm.	17 ,,

As shown by the above table, *manukauensis* is considerably narrower than any of the normal variations of Recent *rosea*. The whorls in *manukauensis* are much more tightly coiled, a specimen 56 mm. in length having 15 post-nuclear-whorls, whereas *rosea* of the same length develops only 13. Also the cords of the biangulation are never so prominent as in *rosea*, consequently the spire outline is straighter, not noticeably gradate or indented at the sutures.

Apparently this is not merely an ecological form due to station, for series from the tidal mud-flats are identical with those from the clean-swept shell-banks in the deeper-water channels.

It seems to be confined to the Manukau Harbour, for all specimens that have been examined from other Recent localities are true *rosea,* even to a series from Kawhia Harbour, which is on the same coast, and where the habitat closely resembles that of the Manukau.

Holotype. (Fig. 9.) Presented to the Auckland Museum.

Habitat. Manukau Harbour. A dominant type on the tidal mud-flats and in the shallow-water channels. Type from mud-flats between mouth of Big Muddy Creek and Cornwallis.

Genus Zeacolpus Finlay 1926.

Type (original designation): *Turritella vittata* Hutton.

Subgenus Stiracolpus Finlay 1926.

Type (original designation): *Turritella symmetrica* Hutton.

Zeacolpus (Stiracolpus) haweraensis n. sp. Fig. 7.

This species differs from Recent *symmetricus* in having only two spiral keels, which divide the height of the whorls evenly into thirds. The secondary sculpture consists of moderately strong spiral threads, three to five per intercarinate space. The base is flattened and crowded with fine spiral threads. Protoconch imperfect in all available specimens. Early post-nuclear whorls bicarinate as in later whorls, but the upper keel is a trifle weaker than the lower one. Spire angle about the same as in Recent *symmetricus.* Whorls 7 to 9 (the holotype has 9), exclusive of the damaged apical whorls.

Height (estimated), 22 mm.; diameter, 7 mm. (holotype).

Holotype and several imperfect paratypes in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

This bicarinate species is not the direct ancestor to *symmetricus,* for a form of that species occurs in beds of Waitotaran age at Kaawa Creek, and furthermore there is an earlier Tertiary tricarinate form in *kanieriensis* (Harris).

Struthiolariidae.

Genus Struthiolaria Lamarck 1816.

Type (monotypy): *Buccinum papulosum* Martyn.

Subgenus Pelicaria Gray, 1857.

Type (monotypy): *Buccinum vermis* Martyn.

Struthiolaria (Pelicaria) incrassata n. sp. Figs. 30-33.

This species is characterized by its massive outer lip, prominent parietal tubercle, small aperture, canaliculate suture and strongly bicarinate body-whorl. The upper carina bears rather

closely spaced blunt nodules, undeveloped except over the body-whorl, where they gradually gain strength towards the aperture. There are faint traces of an obsolete third spiral situated midway between the two carinae. The aperture is proportionately small and very much thickened all round. In *vermis* and *tricarinata* the aperture is much larger and the outer-lip callus extends to about half way between the main carinae, whereas in *incrassata* it terminates very little above the level of the lower carina.

Whorls four to five (five in holotype), exclusive of the missing nuclear whorls. Spire normally, about equal to height of aperture. The holotype has been slightly flattened and elongated by pressure, the smaller specimen exhibiting the true proportions. Suture deeply canaliculate, almost comparable to that of *zelandiae*. The base exhibits a primitive condition in the development of only five basal spirals.

It is difficult to place this species in its true phylogenetic position, but judging from the abnormally crass nature of the shell, deeply channelled suture and comparatively few basal spirals, it is probably a gerontic offshoot from the main line, originating from a type like Suter's *parva*, the locality and horizon of which is unknown.

Marwick in his stratigraphical table (1924, p. 172) has queried *parva* as belonging to the Nukumaruan, but, as stated above, the locality for this species is unknown and may well be from a lower horizon.

Height, (actual) 23.50 mm. (estimated) 24.75 mm.; diameter (actual), 16.00 mm. (holotype).

Height (actual) 33.00 mm., (estimated) 34.50 mm.; diameter (actual), 21.00 mm., (estimated) 19.00 mm. (paratype).

Holotype. (Figs. 30 and 31.) In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.) Two paratypes in writer's collection (collected Jan., 1927).

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

NEPTUNIIDAE.

Genus ZELANDIELLA Finlay 1926.

Type (original designation): *Neptunea subnodosa* Hutton.

Zelandiella pliocenica n. sp. Figs. 11 and 12.

A Pliocene relative of *subnodosa*, the lower Miocene genotype, differing in the subobsolescence of the nodules on the subsutural fold, more twisted canal and deeper basal constriction above fasciole. Also the nodules on the biangulate keels of the body-whorl are smaller, weaker and more numerous than in *subnodosa*, and exhibit a tendency towards lateral compression and subobsolescence on nearing the aperture.

There is another Waitotaran species, *kaawaensis*, but this is more closely allied to *subnodosa* than to *pliocenica*.

Whorls six, exclusive of the nucleus which is worn away. Spire-whorls with a weak subsutural fold, a median concavity and a prominent, nodulous, lower fold. There are fourteen rounded nodules on this lower fold, on the penultimate, and about sixteen on the body-whorl. Secondary sculpture of moderately strong rounded spiral cords; about thirty-five on the body-whorl. Aperture with a deep posterior sinus and a considerably twisted anterior canal, which gives rise to a prominent fasciole, bordered above by a sharp projecting rim and separated from the base by a deep constriction.

Height, 36.5 mm.; diameter, 24.0 mm. (holotype).

Localities. 1171, cliffs on coast, half a mile north-west of Patea River. (Waitotaran) Lower Pliocene (holotype); Waipipi, coast near Waverley at about one mile west of the mouth of Wairoa Stream, in yellowish-brown sandstone. (Waitotaran).

Holotype. In N.Z. Geological Survey Office, Wellington. Waipipi specimen in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.) The writer is much obliged to Dr. Marwick for offering the Patea shell as a more suitable holotype than the badly damaged Waipipi specimen.

Marshall and Murdoch's record of *Siphonalia subnodosa*, in their Waipipi list (1920, p. 125), probably refers to the above described species.

Buccinulidae.

Genus Austrosipho Cossman 1906.

Type (original designation): *Fusus roblini* T. Wds.

Subgenus Verconella Iredale 1914.

Type (original designation): *Fusus dilatatus* Q. & G.

According to Clench (1930, p. 21), the above names as applied to New Zealand shells must both be suppressed in favour of *Penion* Fischer 1884.

The genus name *Penion* was rejected by Iredale (1914, p. 175), on the grounds that it was a homonym of *Penium* Philippi 1865, as both were derived from the same Greek root.

However Clench states that *Penion* is a direct transliteration from the Greek, and that *Penium* is a latinized form of the same word, and, further, points out that according to one of the recommendations to "Article 36" of the "International Rules," names of this sort, differing slightly in termination, should be avoided, but once introduced must not be rejected on this account.

In rejecting *Penion*, Iredale cited "Article 19" of the "Rules," which allows an emendation in the cases of—error of transcription, lapsus calami and typographical error.

A decision hinges on whether *Penium* be considered an error of transcription or not. In any case, the extracts from the "Rules" quoted above are somewhat contradictory.

As a decision either way would not be unanimously accepted if given herein, perhaps the best course is to refer this special case to the International Rules Commission. Pending a decision, the use of *Austrosipho* and *Verconella* is continued.

Austrosipho (Verconella) haweraensis n. sp. Figs. 28 and 29.

Shell ancestral to the Recent *mandarina,* which it closely resembles in form and size, but not in the details of sculpture. A comparison of the sculpture on the penultimate whorl in both species shows the following points of difference. In *mandarina* there are from ten to twelve primary spiral cords, with two, three and occasionally as many as six spiral threads per interspace, compared with nine primary cords and only one thread per interspace in *haweraensis.* The fossil species is most distinctive in its early whorls, which are crossed by distant broad axial folds, nine to thirteen per whorl. These persist over all the post-nuclear whorls, although subobsolete in development. Typical *mandarina* never has axials on the later whorls, although there are from eighteen to twenty-one closely spaced axial folds on the early spire whorls.

Whorls estimated at about nine. The protoconch is missing in the holotype, but a paratype shows a well preserved nucleus of three whorls, as figured for *adusta* (Powell, 1927, p. 550, text fig. 10). The spiral cords, which number nine on the penultimate and about twenty-four on the body-whorl, show a tendency to widen rather than to become prominently elevated, as in *mandarina.* The true outline of the Hawera species is a little narrower than shown in the holotype, which has been subjected to dorso-ventral pressure in the matrix.

Height (apex missing), 123 mm.; diameter (actual) 58 mm., (estimated normal) 56 mm. (holotype).

Height (apex missing), 130 mm.; diameter (actual), — mm., (estimated normal), 57 mm. (paratype).

Holotype (Fig. 28) and two juvenile paratypes in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.) Figured paratype in the writer's collection. (Collected Jan., 1927.)

Locality. On coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

In the figure of paratype some of the ribs appear as paired closely spaced threads, but this is only the result of decortication.

VOLUTIDAE.

Genus ALCITHOE H. and A. Adams 1858.

Type (subsequent designation, Cossmann, 1899): *Buccinum arabicum* Martyn.

Alcithoe larochei Marwick 1926.

Localities. Recent; off Opotiki in 30 fathoms (type); near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran). (Collected by Master C. A. Fleming, Jan., 1931.)

This proved to be moderately plentiful at Waihi, Hawera, but no perfect examples were obtained. However a specimen showing almost the whole of the body-whorl and another complete except for the basal portion, are identical with the holotype of *larochei.*

This record extends the ancestry of *larochei* to a much lower horizon than recorded for *swainsoni.*

COLUMBARIIDAE.

Genus COLUZEA Allan 1926.

Type (original designation): *Fusus dentatus* Hutton.

Coluzea spectabilis n. sp. Figs. 1 and 2.

This species is important, as it helps to fill a gap in the *dentata-spiralis* line. It is quite distinct from its ancestral relatives and its more recent derivatives in having far more numerous peripheral spines, which are weak and closely spaced, resulting in only a slight nodulation of the carina. Shell very large for the genus. Spire tall, about three-fourths height of aperture plus canal (estimated from decollated paratype with complete canal). Whorls about ten, strongly convex and much indented at sutures. Sculpture consisting of prominent spiral carinae crossed by numerous regularly spaced axial growth folds, which render the carinae slightly nodulous at points of intersection. There are about fifty peripheral nodules on the penultimate whorl. On the upper spire-whorls there are three strong carinae above the periphery, then a moderately flat shoulder overhung by the preceding whorl, and below a single strong carina between the periphery and suture. In the holotype there is a weak thread in each intercarinal space. On the base and canal there are fifteen carinae, which gradually become weaker and more closely spaced, finally fading out at about half way down the canal.

Height (actual), 76 mm.; height (estimated), 90 mm.; diameter, 30 mm. (holotype).

Holotype and fragmentary paratype in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.) Two fragmentary paratypes in the writer's collection. (Collected Jan., 1927.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

The Mid-Pliocene form, *C. espinosa* Finlay, which was described from Petane, Hawke's Bay, and is intermediate between the Lower Pliocene *spectabilis* and the Upper Pliocene-Recent *spiralis*, is represented in the writer's collection by a specimen from the blue clay band at Nukumaru Beach.

TURRIDAE.

Genus MARSHALLENA Finlay 1926.

Type (original designation): *Belophos incertus* Marshall.

Marshallena austrotomoides n. sp. Figs. 5 and 6.

The two available specimens are imperfectly preserved, but the characters of the species are so distinctive that it is well worthy of description, particularly as the range of the genus is hereby extended to a much higher stage in the Tertiary than hitherto recorded. Large size and prominent axials, combined with subobsolete spiral sculpture, separate this species from any previously described. Its nearest relative appears to be *M. celsa* Marwick (1931, p. 147), from the Tutamoe Series, Gisborne (Lower Miocene). However, this species is not nearly so large, and has a shorter spire, with more numerous axials, which extend over the body-whorl.

Shell very large, with a tall gradate spire, estimated to be a little taller than height of aperture. Post-embryonic whorls seven, angled at about three-fourths their height, with a concave shoulder above and vertical sides below. Body-whorl large, slightly inflated above and contracting slowly over base. Although the end of the canal is missing in both specimens, the growth lines indicate the absence of an anterior notch. There is also a simple shallow arcuate posterior sinus typical of *Marshallena* and quite unlike that of *Austrotoma*, to which genus the Hawera shell is superficially similar. Sculpture of strong forwardly-inclined axials, which become subobsolete on the body-whorl. The spiral sculpture is also subobsolete, being traceable with difficulty on the spire whorls and upper part of body-whorl, although it becomes moderately strong on the base. The axials number about fourteen on the spire whorls, and the subobsolete spirals about nine. The body-whorl has about twenty irregularly developed spiral cords, which are subobsolete above, but become rather strongly developed below, where they are broad and rounded, with two or three spiral threads per interspace. Shoulder concave with broadly arcuate lines of growth corresponding to the simple shallow sinus.

Height (estimated), 78 mm.; diameter, about 24 mm. (holotype).

Holotype (Fig. 5) in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

Genus PHENATOMA Finlay 1924.

Type (original designation) : *Pleurotoma novaezelandiae* Reeve.

Phenatoma decessor Marwick 1928.

The type is from Whenuataru Peninsula, Pitt Id. Chatham Islands.

Marwick (1928, p. 435) remarked upon the strong Wanganuian affinities of the fossils from this locality.

A single specimen was found in the blue clays at Waihi Beach, Hawera, and it compares well with the original description and figure.

Height (estimated), 19.5 mm.; diameter, 6.25 mm.

Genus COMITAS Finlay 1926.

Type (original designation) : *Surcula oamarutica* Suter.

Comitas declivis n. sp. Fig. 41.

Shell of moderate size, fusiform, with long straight canal and relatively short spire. Aperture plus canal one and a third times height of spire. Protoconch relatively large, of one and a-half smooth, bulbous whorls. Post-nuclear whorls six, subangled below the middle, almost at lower third of whorl-height. Upper slope steep, slightly concave above and below the subangle. Body-whorl rapidly contracted to a long straight canal without a fasciole. Axial sculpture of eleven or twelve strong rounded knobs per whorl, with about equal interspaces. Spiral sculpture obsolete on spire-whorls, but there are about eighteen poorly developed, flattened cords on the lower part of body-whorl and neck of canal. Three of these, situated on the base at a short distance below the nodulous subangle, are a trifle more prominent than the rest. Suture with a slight bulge below, but not definitely submargined. Outer-lip with a deep angular sinus, its apex at about the middle of the shoulder.

Height, 19.0 mm.; diameter, 6.3 mm. (holotype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran).

The species is nearest allied to *C. bilix* Marwick (1931, p. 137), from the Ormond Series, Gisborne, but differs in being much more elongated and with less prominent basal cords.

TEREBRIDAE.

Genus ZEACUMINIA Finlay 1930.

Type *Z. tahuia* Finlay (= *Terebra sulcata* Marshall).

Zeacuminia murdochi n. sp. Fig. 42.

Shell moderately large, attenuated. Spire two and one-fifth times height of aperture, plus canal. Outline of whorls flatly-convex, with a slight constriction towards the upper third of the height of the spire whorls. The protoconch is imperfect in the

two available specimens, but the holotype exhibited a perfect polygyrate apex prior to becoming damaged while being worked from the matrix. Whorls estimated at about 12, including protoconch. Sculpture of strong, widely spaced axial costae (12 on the penultimate), which are rendered slightly sinuous by the subsutural spiral constriction. In addition, there is secondary sculpture of indistinct irregularly developed axial growth folds, varying from three to five per intercostal space. On the body-whorl the costae rapidly diminish below the rounded periphery, and become obsolete on the base. The base is deeply contracted towards the fasciole and the canal is short, obliquely twisted, terminating in a broad arcuate sinus. Fasciole well developed, bordered above by a prominently raised rib, which issues from within the aperture and traverses the inner lip.

Height, (actual) 30.50 mm. (estimated) 31.25 mm.; diameter, 8.25 mm. (holotype).

Height, (actual) 22.50 mm. (estimated) 23.00 mm.; diameter, 7.00 mm. (paratype).

Holotype. In the Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.) Paratype in the writer's collection. (Collected Jan., 1927.)

Localities. On the coast near mouth of Waihi Stream, Hawera. Lower Pliocene (Waitotaran); Waipipi, coast near Waverley, at about $\frac{3}{4}$ mile west of the mouth of Wairoa Stream. (Shell-band in papa). Lower Pliocene (Waitotaran).

This is the first known Pliocene species referrable to *Zeacuminia,* the range of the genus being thus considerably extended. It is quite distinctive in having strong, widely spaced axials which become obsolescent, not nodulous at the periphery of the body-whorl.

Z. murdochi has a superficial resemblance to *Pervicacia,* but it can be readily distinguished by the prominent ridge bordering the fasciole. The species is named after the late Mr. R. Murdoch, in recognition of his excellent malacological and palaeontological work.

Genus PERIRHOE Dall 1908.

Type (original designation): *Terebra circumcincta* Dall.

Subgenus DIMIDACUS Iredale 1929 (for *Terebrina* Bartsch, preoccupied).

Type: *Terebra cingulifera* Lamk.

Perirhoe (Dimidacus) bicorona (Hutton). Figs. 3 and 4.

1885. *Cerithium bicorona* Hutton. Trans. N.Z. Inst. vol. 17, p. 328.

1915. *Terebra catenifera* (Suter) non Tate. N.Z. G.S. Pal. Bull. No. 3, p. 43, Plate 4, fig. 19.

1924. *Terebra bicorona* (Hutton) Marwick. Rep. Aust. Ass. Adv. Sci. (1923) vol. 16, p. 327.

1926. *Acuminia bicorona* (Hutton) (provisional) Finlay. Trans. N.Z. Inst. vol. 57, p. 435.

Two imperfect specimens (Figs. 3 and 4) were collected by the writer from the blue clays at Waihi Beach, Hawera.

Height (estimated), 44 mm. (actual), 27 mm. for $7\frac{3}{4}$ whorls; diameter, 7.0 mm.; spire angle, 10°.

Height (estimated), 54 mm. (actual), 31 mm. for $6\frac{1}{2}$ whorls; diameter, 9.5 mm.; spire angle, 10°.

This is an interesting record from a stratigraphical point of view, as hitherto the species was known only from the fragmentary holotype, which was found at Tutaekuri, Hawke's Bay.

The greatly attenuated spire, heavy subsutural collar, and twisted, recurved canal, separate this species from the *Zeacuminia* series. Living species of *Perirhoe* are known from New South Wales, Queensland and the tropical Pacific.

NEW SPECIES OF MOLLUSCA FROM THE NEW ZEALAND PLIOCENE.

Crassatellitidæ.

Genus Talabrica Iredale 1924.

Type (original designation): *Crassatella aurora* Ad. and Ang.

Talabrica senecta n. sp. Figs. 23 and 24.

Shell ovate-subtrigonal, about the same size as the Recent New Zealand *bellula,* but more massive and less equilateral. Sculpture consisting of coarse, regular, concentric folds, diminishing in strength towards the posterior end, but nowhere flexed or undulating, as in the Recent species. The folds are about one and a-half per millimetre, except towards the umbo, where they are smaller and more closely spaced. They number about twenty-four in the adult shell, with interspaces about half the width of the folds.

The posterior end is slightly longer than the anterior, its dorsal slope straight and descending to an indistinct subtruncation below. Hinge-plate solid and deep, with teeth arranged and formed as in *bellula,* but much more massive. Valve margins smooth.

Height, 15.00 mm.; length, 18.50 mm.; thickness (1 valve), 4.75 mm. (holotype).

Height, 14.50 mm.; length, 17.25 mm.; thickness (1 valve), 4.50 mm. (paratype).

Holotype (Fig. 24) presented to Auckland Museum. (Collected by the writer, Jan., 1926.)

Locality. Castle Point, East Coast, Wellington (in arenaceous deposits above the limestone), in the immediate vicinity of the lighthouse. Mid Pliocene (Nukumaruan).

Talabrica nummaria n. sp. Figs. 19 and 20.

Shell subcircular, massive, very little inflated; posterior end truncated and slightly shorter than anterior end. Beaks small,

erect, contiguous. Sculpture of coarse, unevenly developed, concentric folds, diminishing in strength towards the sides, but nowhere flexed as in the Recent *bellula*. The folds are about one per millimetre and number about twenty-one for the entire shell, having interspaces varying from approximately equal to a little greater than width of folds. Both anterior and posterior dorsal margins descend at about equal angles, but the posterior end is slightly shorter owing to a broad truncation. Hinge massive, but typical in its formation. Valve margin smooth.

Height, 20.50 mm.; length, 22.50 mm.; thickness (2 valves), 10.25 mm. (holotype).

Holotype in Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. Nukumaru Beach, north-west of Wanganui. In sandy pockets in the shell-rock, together with *Barytellina crassidens* Marwick and *Anomia undata* Hutton. Mid Pliocene (Nukumaruan).

This species is possibly a descendant from the New Zealand Miocene *cordiformis* (Suter 1917), but that species differs in its greater inflation, swollen beaks and linear intercostal spaces.

KELLYIDAE.

Genus PUYSEGERIA Powell 1927.

Type (original designation): *P. cuneata* Powell.

Puysegeria wanganuica n. sp. Fig. 39.

This species is the Pliocene ancestor to the Recent *cuneata*. Although the genotype was described from a deep-water station (170 fathoms), there is no bathymetric significance attached to the fossil occurrences, as the Pliocene species is found at Castlecliff, not only in the papa, which has every indication of having been deposited in moderately deep water, but also in a sandy upper stratum which obviously represents shallow-water conditions of deposition, as evidenced by the presence of cake-urchins *Arachnoides placenta*, and the molluscs *Amphidesma pliocenica* and *Zethalia*. The same species of *Puysegeria* is common also in the loose sands at Nukumaru, where it occurs, associated with *Lutraria, Zethalia, Panope, Myadora striata* and other typically shallow-water species.

The new species differs from the genotype in being slightly longer and more oblong, with a straighter dorsal margin. The most striking difference, however, is in the shape of the cardinal of the left valve. This is broadly triangular, with the anterior side produced along the hinge-plate and only a faint suggestion of bifurcation. In *cuneata*, this cardinal of the left valve differs in being definitely bifid and narrowly triangular without the anteriorly produced side. Surface smooth and polished.

Height, 1.20 mm.; length, 0.80 mm. (holotype, left valve).

Height, 1.16 mm.; length, 0.78 mm. (paratype, figured right valve).

Holotype. In Auckland Museum. (From material collected by the writer, Museum field trip, Jan., 1931.)

Localities. Castlecliff (sandy upper bed) (type), Castlecliff (papa), Wanganui, Upper Pliocene (Castlecliffian); Nukumaru (loose sands), Mid. Pliocene (Nukumaruan).

Genus Virmysella Iredale 1930.

Type (original designation): *V. spernax* Iredale.

Virmysella hounselli n. sp. Figs. 13 and 14.

This shell is allied to the New South Wales genotype, but it differs in being considerably smaller and more quadrate in outline.

Shell small, thin, compressed, equivalve, and subquadrately elongate-oval. Surface smooth, apart from faint irregular lines of growth. Anterior end produced and broadly rounded; posterior end short and subtruncated. Umbo situated at the posterior third. Hinge, muscle-scars and pallial line typical. Resilium-pit deep, trigonal.

Right valve with an oblique lamellate cardinal bordering the anterior side of the resilifer and a shorter, more upright one at the posterior side. There is a socket in front of the anterior cardinal and another immediately behind the posterior cardinal, both of which are for the accommodation of thickened margins in the opposite valve. Apart from these thickened margins in the left valve, there is a small socket which is in apposition to the posterior cardinal of the right valve.

Height, 4.25 mm.; length, 6.25 mm.; thickness (one valve), 1.00 mm. (holotype).

Holotype. (Fig. 13.) In Auckland Museum. (Material collected by the writer, Museum field trip, Jan., 1931.)

Locality. Castlecliff (basal papa), Wanganui. Upper Pliocene (Castlecliffian).

The New Zealand Recent *"Montacuta" tellinula* Odhner 1924, seems referrable to *Virmysella,* and a second North Auckland Recent species, at present undescribed, combines the hinge development of *tellinula,* with a shape more like that of the Pliocene species.

The species is named after Mr. W. K. Hounsell, who discovered the specimens while sorting through sievings of the Castlecliff matrix. The writer wishes to acknowledge the considerable voluntary assistance rendered by Mr. Hounsell during the past two years.

Myochamidae.

Genus Myadora Gray 1840.

Myadora kaiiwiensis n. sp. Figs. 37 and 38.

This species is nearest allied to the Recent *boltoni* Smith, but differs in being more ovate and differently proportioned. In

boltoni the anterior is considerably longer than the posterior end, but in the fossil species the beaks are nearly central and the ends approximately equal.

Shell of moderate size, transversely elongate-oval, posterior end broadly truncated. The convex right valve has a ridge running from the umbo to the lower extremity of the truncation, and this cuts off a shallowly-concave posterior area. Sculpture consisting of irregularly developed concentric ridges (about 22), which are subobsolete, except towards the margins and where they intersect the posterior ridge. Left valve almost flat, often very slightly convex. Posterior area marked off by a slight flattening. Sculpture of subobsolete flattened concentric ridges, very irregular in their development.

Height, 10.50 mm.; length, 13.75 mm.; thickness, 2.90 mm. (holotype).

Holotype. In Auckland Museum. (Collected by the writer, Museum field trip, Jan., 1931.)

Locality. Kai Iwi, on the coast, half a mile north-west of the Kai Iwi Stream. Upper Pliocene (Castlecliffian).

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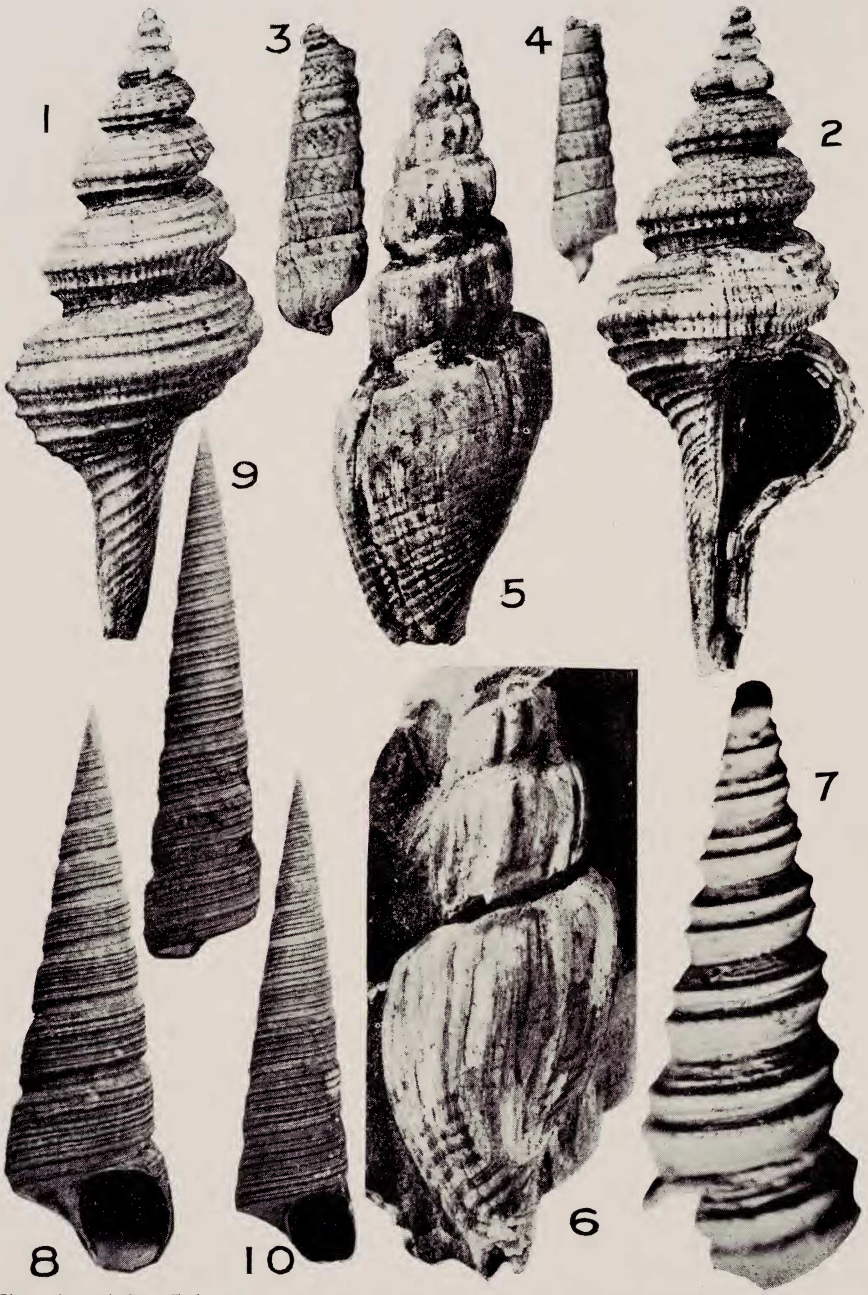
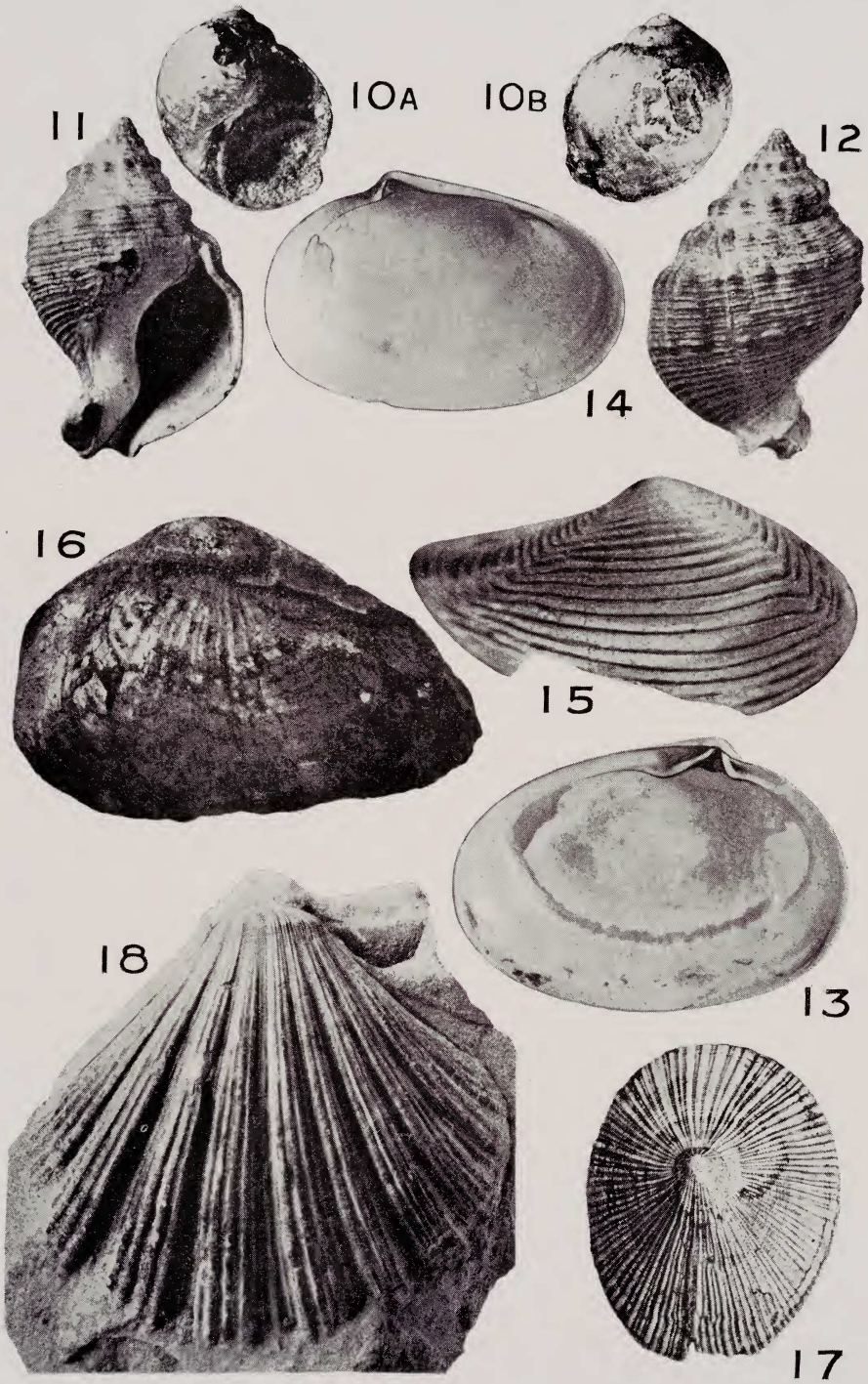
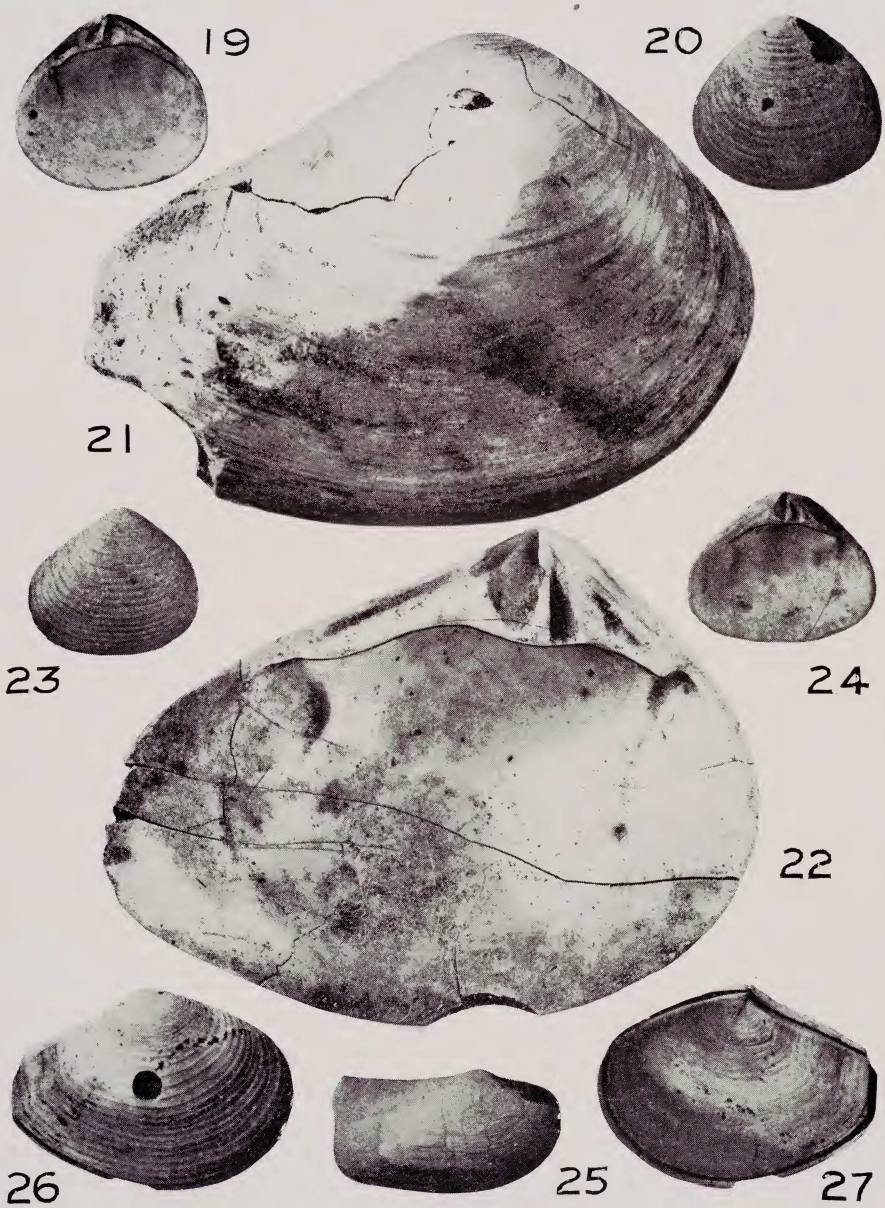


Figs. 1 and 2. *Co'usca spectabilis* n. sp. (holotype), Waihi, Hawera, X 1.
Figs. 3 and 4. *Perirhoe (Dimidacus) bicorona* (Hutton), Waihi, Hawera. X 1-1/6.
Fig. 5. *Marshallena austrotomoides* n. sp. (holotype), Waihi, Hawera, X 1-1/10.
Fig. 6. *Marshallena austrotomoides* n. sp. (paratype), X 1-1/3.
Fig. 7. *Zeacolpus (Stiracolpus) haweraensis* n. sp. (holotype), Waihi, Hawera, X 3-1/2.
Fig. 8. *Maoricolpus rosea* (Q. & G.), Recent, Picton, X 1-1/6.
Fig. 9. *Maoricolpus rosea manukauensis* n. subsp. (holotype), Recent, Manukau Harbour, X 1-1/6.
Fig. 10. *Maoricolpus rosea manukauensis* n. subsp. (paratype), X 1-1/6.



Figs. 10A. and 10B. *Globisinum flemingi* n. sp. (holotype), Waipipi, X 1-1/5.
Figs. 11 and 12. *Zelandiella pliocenica* n. sp. (holotype), Patea, X 1-1/7.
Fig. 13. *Virmysella hounselli* n. sp. (holotype), Castlecliff, Wanganui, X 8-1/3.
Fig. 14. *Virmysella hounselli* n. sp. (paratype), X 8-1/3.
Fig. 15. *Nuculana (Saccella) waihiana* n. sp. (holotype), Waihi, Hawera, X 7-3/4.
Fig. 16. *Pholadomya waitotarana* n. sp. (holotype), Waipipi, X 1-1/7.
Fig. 17. *Emarginula haweraensis* n. sp. (holotype), Waihi, Hawera, X 1.
Fig. 18. *Pallium (Mesopeplum) waikohuensis* Marwick. Waihi, Hawera, X 1-1/10.



Figs. 19 and 20. *Talabrica nummaria* n. sp. (holotype), Nukumaru, X 1-1/16.
Figs. 21 and 22. *Eucrassatella marshalli* n. sp. (holotype), Waipipi, X 1-1/3.
Fig. 23. *Talabrica senecta* n. sp. (paratype), X 1-1/3.
Fig. 24. *Talabrica senecta* n. sp. (holotype), Castle Point, X 1-1/3.
Fig. 25. *Neilo annectens* n. sp. (holotype), Waihi, Hawera, X 1-1/5.
Figs. 26 and 27. *Myadora waitotarana* n. sp. (holotype), Waihi, Hawera, X 1-1/4.

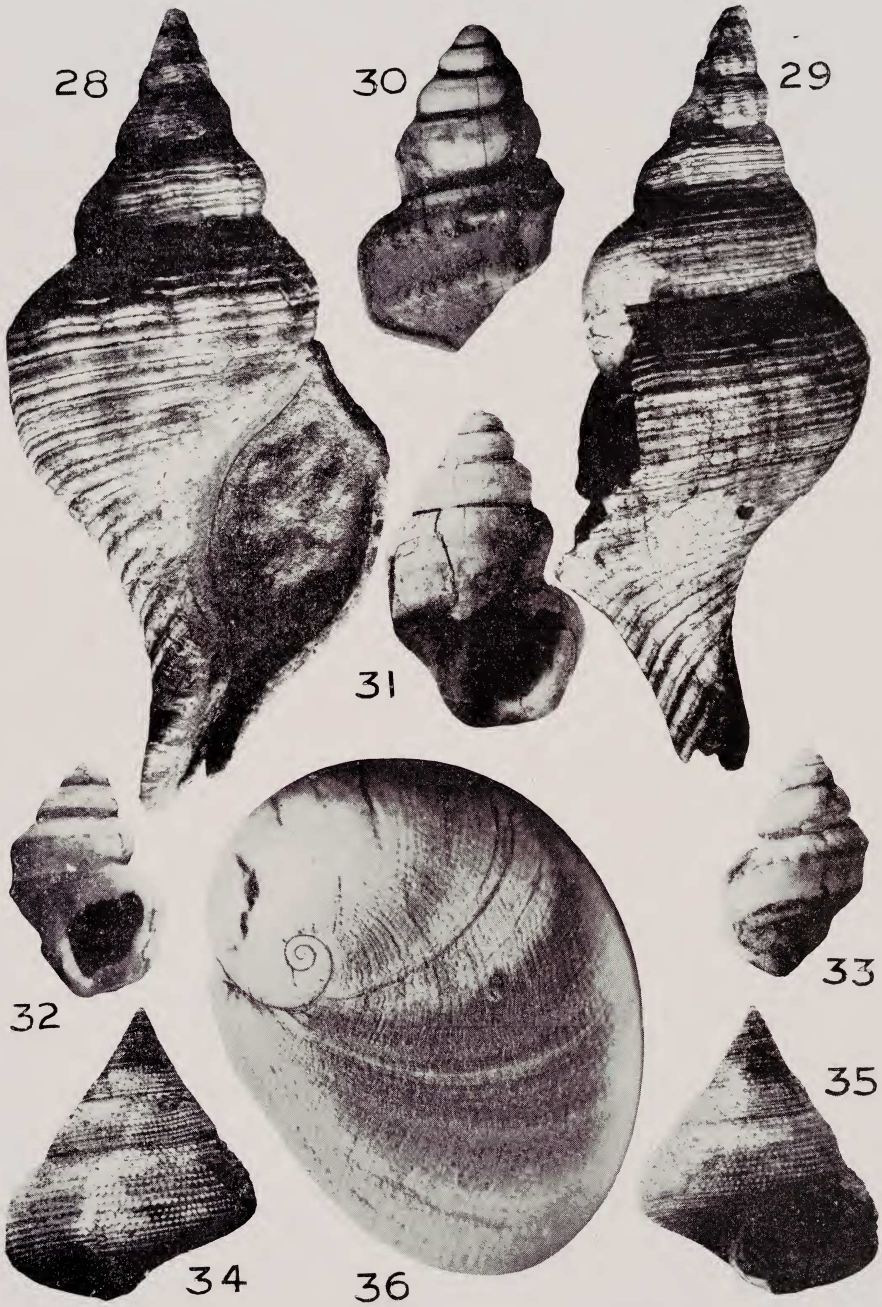
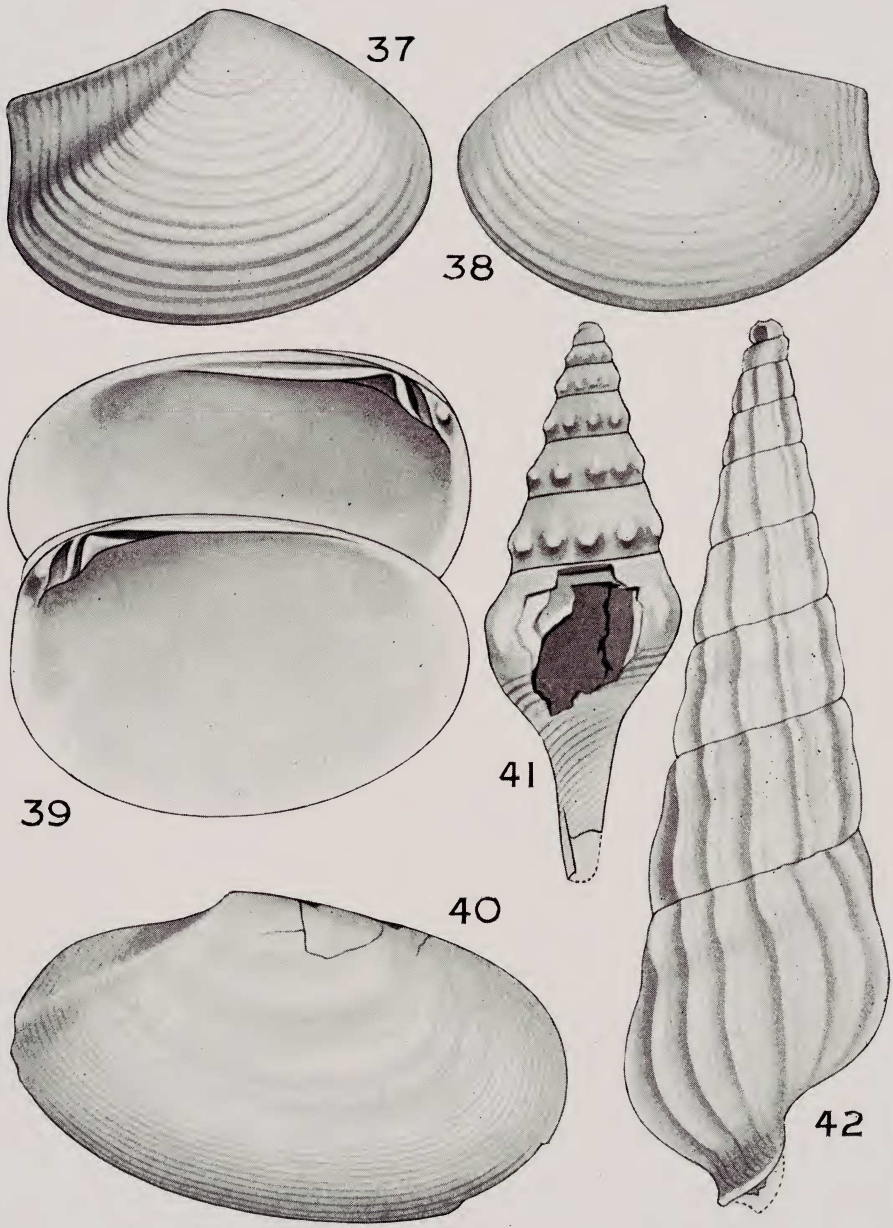


Fig. 28. *Austrosipho (Verconella) haweraensis* n. sp. (holotype), Waihi, Hawera, X 4/5.
Fig. 29. *Austrosipho (Verconella) haweraensis* n. sp. (paratype), X 4/5.
Figs. 30 and 31. *Struthiolaria (Pelicaria) incrassata* n. sp. (holotype), Waihi, Hawera, X 1-1/5.
Figs. 32 and 33. *Struthiolaria (Pelicaria) incrassata* n. sp. (paratype), X 1-1/5.
Figs. 34 and 35. *Maurea (Mucrinops) granti* n. sp. (holotype), Waihi, Hawera, X 1.
Fig. 36. *Sinum* cf. *marwicki* Laws, Waihi, Hawera, X 4-2/3.



Figs. 37 and 38. *Myadora kaiiwiensis* n. sp. (holotype), Kai Iwi, X 3-3/4.
Fig. 39. *Puyscgeria wanganuica* n. sp. (holotype, left valve), Castlecliff, Wanganui, X 72-1/2.
Fig. 40. *Eurytellina solitaria* n. sp. (holotype), Waihi, Hawera, X 2-2/3.
Fig. 41. *Comitas declivis* n. sp. (holotype), Waihi, Hawera, X 3-2/3.
Fig. 42. *Zeacuminia murdochi* n. sp. (holotype), Waihi, Hawera, X 3-2/3.